PROFILE

Science and a Hungry World

H. A. Fowells

Assistant Director, International Programs Division, Agricultural Research Service, USDA, Hyattsville, Md. 20782

ABSTRACT

A primary objective of Public Law 480 was to combat hunger in the world. Several provisions of the Law authorized the use of foreign currencies generated by PL 480 sales for scientific purposes. Several government agencies have used the authorization to make research grants. These research grants have enhanced scientific activities in a number of countries and have improved international cooperation among scientists.

In passing Public Law 480, the 83rd Congress made available to a hungry world the productivity and abundance of American agriculture. In the Agricultural Trade Development and Assistance Act of 1954, Congress declared it to be the policy of the United States to expand international trade, to use the abundant productivity of U.S. agriculture to combat hunger and malnutrition and to encourage economic development in the developing countries. The Law initially provided that surplus agricultural commodities could be sold to friendly nations for their currencies. A part of these currencies was reserved for the use of the United States; a major part was available as long-term loans for country development. From the beginning of the program in Fiscal Year 1955 through Fiscal Year 1970, more than $12 billion[1] worth of agricultural commodities had been sold for foreign currencies, of which about $3 billion were reserved for uses of the United States Government.

The Act of 1954 provided (Sec.104(a)) that the foreign currencies accruing under the Act could be used to help develop new markets for United States agricultural commodities on a mutually benefitting basis. This subsection was interpreted to include research necessary for market development.

In 1958 and 1959, the Act was amended to authorize the use of foreign currencies "to collect, collate, translate, abstract, and disseminate scientific and technological information and to conduct research and support scientific activities overseas including programs and projects of scientific cooperation between the United States and other countries such as coordinated research against diseases common to all of mankind or unique to individual regions of the globe,

[1] Data on the Law from "The annual report on activities carried out under Public Law 480, as amended, during the period January 1 through December 31, 1969." Richard Nixon, June 18, 1970.

and to promote and support programs of medical and scientific research, cultural and educational development, health, nutrition, and sanitation: . . . ."

Hungry people in many nations of the world were fed as the result of this farsighted legislation. Also, scientifically-starved universities and research institutes were nourished by grants for research, under the provisions of Sec. 104(a) and (k) (now 104(b)(1) and (b)(3)), as a consequence of the humanitarian effort to feed people.

Several U.S. agencies seized the opportunity to cooperate with foreign institutions in research of mutual interest. Among these are the Department of Agriculture, the Department of Commerce, the Department of Health, Education, and Welfare, the Department of the Interior, and the Smithsonian Institution. In addition, the National Science Foundation has used the foreign currencies to defray the cost of translating into English more than 400,000 pages of foreign scientific literature and of publishing the translations. Also, the Library of Congress has used the foreign currencies to acquire and distribute English and foreign-language publications in the foreign countries and the U.S. Other agencies are considering programs using the foreign currencies.

Of about $166 million, equivalent in foreign currencies, used for research grants, the Department of Health, Education, and Welfare and the Department of Agriculture have sponsored, by far, the largest programs.

USDA Program

The Department of Agriculture was the first government agency to take advantage of the research-grant provisions of PL 480. This early start resulted in an extensive program, with about 1,100 grants totalling more than $70 million as of the end of Fiscal Year 1970. Grants were made to scientific institutes and universities in 31 countries in all continents except North America. By policy, grants were limited to a period of 5 years, and the majority of them were made for that period of time. The Agricultural Research

Prof. Artturi Virtanen, Finnish Nobel Prize winning biochemist, conducted a study on properties of milk from cows fed with a synthetic diet.

Service (ARS) was designated as the agency in USDA for administration of the program, which spanned the interests of the Department's research agencies, ARS, the Forest Service, the Economic Research Service, and the Statistical Reporting Service.

Included in the program were grants for research on all phases of agricultural production; for improved uses of agricultural products, especially for those crops for which surpluses existed; for better marketing and storage of agricultural products; production, protection, and utilization of forests and forest products; and economic analyses of agricultural technologies and systems. At the outset of the program, teams of agricultural scientists visited research institutes in the various countries to explain the program and to develop proposals for research of mutual interest. Subsequently, as the program became understood, most proposals have originated from the institutes directly. There are now more acceptable proposals on hand than can be funded in any single year.

To administer the program, the Division of International Programs (originally designated differently) was created in ARS, and regional offices were established in Rome and in New Delhi. The staffs of these two regional offices administer the on-the-ground aspects of the grants.

One of the unique features of the program, adopted by USDA to get the most out of the research, has been the assignment of a sponsoring scientist for each grant. He, usually the most knowledgeable USDA scientist in the particular field of study, reviews progress in the research and suggests different approaches or techniques when appropriate. He may conduct an on-the-ground review of the research, and he is encouraged to correspond freely with the foreign scientist. In many instances, lasting scientific relationships have resulted from these contacts in the PL 480 grants.

Also, the grants usually contain provisions (except now in India and Pakistan) for the foreign scientist to visit the U.S. or other countries where similar research is underway. These visits not only broaden the visiting scientist but the host scientist as well.

In addition, USDA scientists visiting foreign institutions are requested to be prepared to give seminars in their fields of research. This feature of the program has been extremely popular in some countries.

Indian forest scientists have been studying the physiology of rooting of pines—trees which are difficult to propagate vegetatively.

Benefits of USDA Program

This foreign-grant program has not been another U.S. give-away program. At the outset, the policy was adopted that the research should be relevant to the program of the Department of Agriculture and the results of potential value to the U.S. All proposals are screened with these guidelines and many are rejected because they do not fulfill these requirements. As in all research programs, few of the grants have resulted in earth-shaking discoveries. However, a great many have yielded results of value to the U.S.

Breeders of farm crops in the U.S. have received much new germ plasm for incorporation into domestic breeding programs. More than 8,000 samples of seed of crop

plants have been received. Some, like the oat from Israel, hold promise of very valuable new varieties. In searching for resistance to stem and crown rusts of oats, Israeli pathologists found an isolated colony of the wild oat which exhibited resistance. Carefully controlled inoculation tests verified that the oats were resistant. Seed was sent to ARS for use in a breeding program to develop a resistant variety. In addition to the very important characters of resistance, the Israeli oat had a large groat and exceptionally high protein content. New oat varieties are now being developed for commercial use, based on the germ plasm from Israel.

Especially important, in this period of de-emphasis on the use of chemical pesticides, is the research on biological control of harmful insects. Many of our most damaging insect pests came from abroad without their natural control agents. More than 100 shipments of potential parasites and predators of insect pests have been received from grantees in foreign countries. These putative control agents were identified and screened in their native habitat for control possibilities before being sent to the U.S. Parasites or predators have been received for such disastrous pests as the gypsy moth, the boll weevil, the balsam woolly aphid, the sugarcane borer, the corn earworm, and the cereal leaf beetle. This last insect, endemic to much of Europe, was first found in the U.S. in 1962. It threatens 40 million acres of grain production. The alternative to successful biological control may be expensive—and undesirable—chemical control.

The PL 480 grant program has enabled animal scientists to learn much about exotic animal diseases. Some of these diseases have been kept from the U.S. by strict quarantine and inspection procedures. But they are always a threat. An outbreak of African swine fever, for example, could be a disaster for the swine industry in the U.S. The disease does not exist here and cannot be studied here. But it is found in southern Europe and north Africa, where American tourists frequently visit. Spanish scientists discovered that the disease could be transmitted by ticks, and they verified diagnostic techniques on more than 20,000 infected

Israeli scientists screened wild oats for resistance to rusts.

animals. A number of projects have been concerned with the nature and control of foot-and-mouth disease. Altogether, about 60 grants in 10 countries have been made for studies of animal diseases and parasites.

Much new information on plants, fungi, and insects has been developed by investigators in the research projects. A number of new species of fungi and of insects, and even a few new genera, have been described and specimens added to international collections.

Also, botanical information not readily available to western scientists is being made available. For example, a professor of dendrology at the University of Taiwan is in the final phases of preparation of a monograph on the genus *Abies*. This genus contains about 40 species, a great number of which are native to Asia and are little known to western foresters. Already available in report form is a monographic revision of the tamarisks, prepared by an Israeli botanist. Taxonomy in this genus has long been confusing to American botanists.

Studies on various physical and chemical properties of farm products, such as cotton, wool, corn, wheat, soybeans, and leather, have contributed much new knowledge for the processing industries. Seventeen patents have been issued so far, and more are under consideration. Of very practical significance, with an immediate payoff, was research in Japan on the use of soybeans. Scientists

there found that certain American varieties of soybeans were superior to Asiatic varieties for certain traditional Japanese foods. A new market for variety-identified soybeans resulted, worth quite a few million dollars a year to American farmers.

In the United Kingdom, studies on the interaction of modified linseed oil and metal surfaces led to a new rust preventive coating for iron or steel. Five public service patents resulted from this one research project.

Benefits to Grantee Country

No estimates can be made of the value to the grantee countries of the new information resulting from this program of mutual interest research. But it is reasonable to believe that there has been a significant improvement in agricultural and forestry technology.

One very obvious benefit has been the upgrading of research facilities. The grants have provided a certain amount of money for the purchase of scientific equipment. With the termination of the grant, the equipment, usually purchased on a cost-sharing basis, becomes the property of the laboratory.

Also of apparent benefit to the grantee country has been the opportunity for young scientists to further their scientific training while participating in the research. Conservative estimates show that at least 3,000 young scientists have been employed in the grant program. A great many have used phases of the grant research for their graduate degrees. A summary prepared by the Polish Academy of Sciences showed that during a 9-year period, 57 masters degrees and 41 doctorate degrees resulted from 63 grants. In addition, seven scientists progressed to their docent degrees. In Israel, five M.S. and Ph.D. degrees resulted from the research in a single grant.

More intangible has been the benefit resulting from interchange of ideas among scientists. The designation of a USDA scientist as a counterpart or sponsoring scientist in each grant has resulted in many associations that continue after the grant terminates. In fact, an official of ministry level in one of the participating countries remarked that his government felt the scientific contacts were the most valuable benefit of the program.

Although a primary objective of the Law, to use the abundance of American agriculture to combat hunger, has been met in some of the participating countries, the scientific spin-offs will continue for years to come.